

# Best Practices for Road Weather Management

## Montana DOT Anti-Icing/Deicing Operations

On December 14, 2000 a winter storm threatened State Route 200 in Montana. The Missoula Maintenance Division of the Montana Department of Transportation (DOT) maintains the Plains section of this route. The Thompson Falls section is maintained by the Kalispell Maintenance Division. Although temperatures were comparable, only eight inches (20 centimeters) of snow fell on the Plains section. In the Thompson Falls area, the storm was more severe with 15 inches (38 centimeters) of snow followed by eight hours of freezing rain. The divisions applied different operational techniques to treat snow and ice.

*System Components:* Winter maintenance managers in both areas employ mobile treatment strategies in response to winter storm threats. Maintenance vehicles equipped with liquid chemical storage and spray systems are used to treat roads. Liquid magnesium chloride is applied to anti-ice and deice pavement. Abrasives are also spread on roadways to improve traction.

*System Operations:* In the Plains section, maintenance vehicles applied 3,000 gallons (11,355 liters) of magnesium chloride during and after the storm, resulting in bare pavement conditions. On the road section in Thompson Falls, 800 gallons (3,028 liters) of chemical were used to pre-wet abrasives before application to compacted snow. Another 750 gallons (2,839 liters) of magnesium chloride were used for anti-icing and deicing in an air quality non-attainment area.

Once the storm passed, numerous complaints were received from drivers due to striking differences in road surface conditions in the area separating the Plains and Thompson Falls road sections. The pavement was bare in Plains section, while the Thompson Falls section was compacted with snow and ice.

*Transportation Outcome:* To understand what caused the differences, the DOT's Maintenance Review Section interviewed maintenance managers and analyzed material usage and operating costs from 1997 to 2000. Four-year averages are listed in the following table. The treatment strategy utilized in the Plains section costs 37 percent less than the approach used in Thompson Falls, representing increased productivity. A higher roadway level of service was achieved in the Plains section resulting in safety and mobility enhancements. Environmental outcomes were improved by minimizing abrasive usage; which contributes to poor air quality, drainage facility damage, and negative impacts on wildlife habitats.



Thompson Falls Section



Plains Section

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Montana DOT Winter Maintenance Annual Averages

	Thompson Falls Section	Plains Section	Percent Difference
Sand Quantities	73 cubic yards (56 cubic meters)	43 cubic yards (33 cubic meters)	41%
Sand Costs per lane mile	\$724	\$407	44%
MgCl Costs per lane mile	\$136	\$233	N/A
Material Costs per lane mile	\$860	\$640	26%
Equipment Costs per lane mile	\$327	\$182	44%
Labor Costs per lane mile	\$564	\$273	52%
<b>Total Costs per lane mile</b>	<b>\$1,750</b>	<b>\$1,095</b>	<b>37%</b>

*Implementation Issues:* Interviews conducted by the DOT's Maintenance Review Section revealed that institutional factors impact winter maintenance operations. The review of operational procedures and roadway impacts revealed that managers had varying interpretations of level of service guidelines and different budgetary concerns. A comparison of treatment strategies demonstrated the benefits of preventive versus reactive treatment strategies. By applying anti-icing chemicals before or at the beginning of a storm event, compacted snow was avoided or easily removed. Reactive treatment required multiple material applications and only temporarily improved traction on snow-covered roads.

Managers in the Plains section typically ordered anti-icing chemicals for an average winter and allowed field supervisors to order additional chemicals as needed. Due to adequate material supplies, anti-icing chemicals were readily dispensed and a relatively high chemical content (i.e., 7.5 percent salt-to-sand) was used in abrasive applications. Kalispell maintenance managers estimated chemical quantities at the beginning of winter and did not purchase additional materials through the season. This more conservative approach was employed to ensure that materials were available throughout the winter. Consequently, the chemical content of abrasives applied in Thompson Falls was only four percent salt-to-sand. Liquid magnesium chloride was used primarily for pre-wetting of abrasives and direct application to pavement was limited to non-attainment areas.

Since the Maintenance Review Section has shown that proactive treatment is cost effective, Kalispell managers have increased the chemical content of salt-to-sand from four to seven percent. Maintenance managers plan to conduct further evaluations of anti-icing strategies and to examine and modify operational guidelines, as appropriate.

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*Reference(s):*

- Williams, D. and Linebarger, C., "Winter Maintenance in Thompson Falls," Montana Department of Transportation Maintenance Division, December 2000.

*Keywords:* snow, ice, winter storm, anti-icing/deicing operations, winter maintenance, freeway management, treatment strategy, institutional issues, maintenance vehicle, chemicals, costs, safety, mobility, productivity